Mathematics Section A

Section Id :	864351756
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351983
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 86435117800 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the domain of the function $f(x) = \dfrac{\cos^{-1}\sqrt{x^2 - x + 1}}{\sqrt{\sin^{-1}\left(\dfrac{2x-1}{2}\right)}}$ is the interval $(\alpha, \beta]$, then $\alpha+\beta$ is equal to :

Options :

86435159981. 1

86435159982. 2

86435159983. $\frac{1}{2}$

86435159984. $\frac{3}{2}$

Question Number : 62 Question Id : 86435117801 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The number of solutions of $\sin^7 x + \cos^7 x = 1,\ x \in [0, 4\pi]$ is equal to :

Options :

86435159985. 5

86435159986. 7

86435159987. 9

86435159988. 11

Question Number : 63 Question Id : 86435117802 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the shortest distance between the straight lines $3(x-1) = 6(y-2) = 2(z-1)$ and $4(x-2) = 2(y-\lambda) = (z-3),\ \lambda \in \mathbf{R}$ is $\frac{1}{\sqrt{38}}$, then the integral value of λ is equal to :

Options :

86435159989. -1

86435159990. 2

86435159991. 3

86435159992. 5

Question Number : 64 Question Id : 86435117803 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $A=[a_{ij}]$ be a real matrix of order 3×3, such that $a_{i1}+a_{i2}+a_{i3}=1$, for $i=1, 2, 3$. Then, the sum of all the entries of the matrix A^3 is equal to :

Options :

86435159993. 1

86435159994. 2

86435159995. 3

86435159996. 9

Question Number : 65 Question Id : 86435117804 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $f: \mathbf{R} \to \mathbf{R}$ be defined as $f(x) = \begin{cases} \dfrac{x^3}{(1-\cos 2x)^2} \log_e\left(\dfrac{1+2xe^{-2x}}{(1-xe^{-x})^2}\right), & x \neq 0 \\ \alpha, & x = 0 \end{cases}$.

If f is continuous at $x = 0$, then α is equal to :

Options :

86435159997. 0

86435159998. 1

86435159999. 2

86435160000. 3

Question Number : 66 Question Id : 86435117805 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following Boolean expressions is **not** a tautology ?

Options :

86435160001. $(p \Rightarrow q) \vee (\sim q \Rightarrow p)$

86435160002. $(p \Rightarrow \sim q) \vee (\sim q \Rightarrow p)$

86435160003. $(\sim p \Rightarrow q) \vee (\sim q \Rightarrow p)$

86435160004. $(q \Rightarrow p) \vee (\sim q \Rightarrow p)$

Question Number : 67 Question Id : 86435117806 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $E_1 : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b$. Let E_2 be another ellipse such that it touches the end points of major axis of E_1 and the foci of E_2 are the end points of minor axis of E_1. If E_1 and E_2 have same eccentricities, then its value is :

Options :

86435160005. $\frac{-1+\sqrt{5}}{2}$

86435160006. $\frac{-1+\sqrt{8}}{2}$

86435160007. $\frac{-1+\sqrt{6}}{2}$

86435160008. $\frac{-1+\sqrt{3}}{2}$

Question Number : 68 Question Id : 86435117807 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let a line $L : 2x + y = k, k > 0$ be a tangent to the hyperbola $x^2 - y^2 = 3$. If L is also a tangent to the parabola $y^2 = \alpha x$, then α is equal to :

Options :

86435160009. -12

86435160010. 12

86435160011. -24

86435160012. 24

Question Number : 69 Question Id : 86435117808 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let L be the line of intersection of planes $\vec{r}\cdot(\hat{i}-\hat{j}+2\hat{k})=2$ and $\vec{r}\cdot(2\hat{i}+\hat{j}-\hat{k})=2$. If $P(\alpha, \beta, \gamma)$ is the foot of perpendicular on L from the point $(1, 2, 0)$, then the value of $35(\alpha+\beta+\gamma)$ is equal to :

Options :

86435160013. 101

86435160014. 119

86435160015. 134

86435160016. 143

Question Number : 70 Question Id : 86435117809 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $y=y(x)$ be the solution of the differential equation

$\operatorname{cosec}^2 x\, dy+2dx=(1+y\cos 2x)\operatorname{cosec}^2 x\, dx$, with $y\left(\frac{\pi}{4}\right)=0$. Then, the value of $(y(0)+1)^2$ is equal to :

Options :

86435160017. e

86435160018. e^{-1}

86435160019. $e^{-1/2}$

86435160020. $e^{1/2}$

Question Number : 71 Question Id : 86435117810 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let the circle $S: 36x^2+36y^2-108x+120y+C=0$ be such that it neither intersects nor touches the co-ordinate axes. If the point of intersection of the lines, $x-2y=4$ and $2x-y=5$ lies inside the circle S, then :

Options :

86435160021. $100 < C < 156$

86435160022. $81 < C < 156$

86435160023. $\frac{25}{9} < C < \frac{13}{3}$

86435160024. $100 < C < 165$

Question Number : 72 Question Id : 86435117811 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ be such that $\vec{a} \times \vec{b} = \vec{c}$, $\vec{b} \times \vec{c} = \vec{a}$ and $|\vec{a}| = 2$. Then which one of the following is **not** true ?

Options :

86435160025. $\left[\vec{a}\ \vec{b}\ \vec{c}\right] + \left[\vec{c}\ \vec{a}\ \vec{b}\right] = 8$

86435160026. $\vec{a} \times \left(\left(\vec{b} + \vec{c}\right) \times \left(\vec{b} - \vec{c}\right)\right) = \vec{0}$

86435160027. $\left|3\vec{a} + \vec{b} - 2\vec{c}\right|^2 = 51$

86435160028. Projection of $\vec{a}$ on $\left(\vec{b} \times \vec{c}\right)$ is 2

Question Number : 73 Question Id : 86435117812 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Four dice are thrown simultaneously and the numbers shown on these dice are recorded in 2×2 matrices. The probability that such formed matrices have all different entries and are non-singular, is :

Options :

86435160029. $\frac{45}{162}$

86435160030. $\frac{22}{81}$

86435160031. $\frac{23}{81}$

86435160032. $\frac{43}{162}$

Question Number : 74 Question Id : 86435117813 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let S_n denote the sum of first n-terms of an arithmetic progression. If $S_{10}=530$, $S_5=140$, then $S_{20}-S_6$ is equal to :

Options :

86435160033. 1842

86435160034. 1852

86435160035. 1862

86435160036. 1872

Question Number : 75 Question Id : 86435117814 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $f: \mathbf{R} \to \mathbf{R}$ be defined as

$$f(x) = \begin{cases} -\frac{4}{3}x^3 + 2x^2 + 3x, & x > 0 \\ 3xe^x \quad , & x \leq 0 \end{cases}$$

Then f is increasing function in the interval.

Options :

86435160037. $\left(-\frac{1}{2}, 2\right)$

86435160038. $(-3, -1)$

86435160039. $\left(-1, \frac{3}{2}\right)$

86435160040. $(0, 2)$

Question Number : 76 Question Id : 86435117815 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $\int_0^{100\pi} \frac{\sin^2 x}{e^{\left(\frac{x}{\pi} - \left[\frac{x}{\pi}\right]\right)}} dx = \frac{\alpha\pi^3}{1+4\pi^2}, \alpha \in \mathbf{R}$,

where $[x]$ is the greatest integer less than or equal to x, then the value of α is :

Options :

86435160041. $150\ (e^{-1} - 1)$

86435160042. $50\ (e-1)$

86435160043. $100\ (1-e)$

86435160044. $200\ (1-e^{-1})$

Question Number : 77 Question Id : 86435117816 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The values of λ and μ such that the system of equations $x+y+z=6,\ 3x+5y+5z=26,\ x+2y+\lambda z=\mu$ has no solution, are :

Options :

86435160045. $\lambda \neq 2,\ \mu = 10$

86435160046. $\lambda = 2,\ \mu \neq 10$

86435160047. $\lambda = 3,\ \mu \neq 10$

86435160048. $\lambda = 3,\ \mu = 5$

Question Number : 78 Question Id : 86435117817 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let n denote the number of solutions of the equation $z^2 + 3\bar{z} = 0$, where z is a complex number. Then the value of $\sum_{k=0}^{\infty} \frac{1}{n^k}$ is equal to :

Options :

86435160049. 1

86435160050. $\frac{3}{2}$

86435160051. 2

86435160052. $\frac{4}{3}$

Question Number : 79 Question Id : 86435117818 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $[x]$ denote the greatest integer less than or equal to x. Then, the values of $x \in \mathbf{R}$ satisfying the equation $[e^x]^2 + [e^x + 1] - 3 = 0$ lie in the interval :

Options :

86435160053. $[0, 1/e)$

86435160054. $[1, e)$

86435160055. $[0, \log_e 2)$

86435160056. $[\log_e 2, \log_e 3)$

Question Number : 80 Question Id : 86435117819 Question Type : MCQ

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let a vector $\vec{a}$ be coplanar with vectors $\vec{b} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} + \hat{k}$. If $\vec{a}$ is perpendicular to $\vec{d} = 3\hat{i} + 2\hat{j} + 6\hat{k}$, and $|\vec{a}| = \sqrt{10}$. Then a possible value of $[\vec{a}\ \vec{b}\ \vec{c}] + [\vec{a}\ \vec{b}\ \vec{d}] + [\vec{a}\ \vec{c}\ \vec{d}]$ is equal to :

Options :

86435160057. -40

86435160058. -42

86435160059. -38

86435160060. -29

Mathematics Section B

Section Id :	864351757
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351984
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 86435117820 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $A=\{0, 1, 2, 3, 4, 5, 6, 7\}$. Then the number of bijective functions $f: A \to A$ such that $f(1)+f(2)=3-f(3)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 82 Question Id : 86435117821 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $A=\begin{bmatrix}0 & 1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$. Then the number of 3×3 matrices B with entries from the set $\{1, 2, 3, 4, 5\}$ and satisfying $AB=BA$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 83 Question Id : 86435117822 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The area (in sq. units) of the region bounded by the curves $x^2+2y-1=0$, $y^2+4x-4=0$ and $y^2-4x-4=0$, in the upper half plane is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 84 Question Id : 86435117823 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the digits are not allowed to repeat in any number formed by using the digits 0, 2, 4, 6, 8, then the number of all numbers greater than 10,000 is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 85 Question Id : 86435117824 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $f:\mathbf{R}\to\mathbf{R}$ be a function defined as $f(x)=\begin{cases}3\left(1-\frac{|x|}{2}\right) & \text{if } |x|\le 2\\ 0 & \text{if } |x|>2\end{cases}$

Let $g:\mathbf{R}\to\mathbf{R}$ be given by $g(x)=f(x+2)-f(x-2)$. If n and m denote the number of point $\mathbf{R}$ where g is not continuous and not differentiable, respectively, then n + m is equa

_____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 86 Question Id : 86435117825 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The sum of all the elements in the set $\{n\epsilon\{1, 2, \ldots\ldots, 100\} \mid$ H.C.F. of n and 2040 is 1$\}$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 87 Question Id : 86435117826 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the constant term, in binomial expansion of $\left(2x^r + \frac{1}{x^2}\right)^{10}$ is 180, then r is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 88 Question Id : 86435117827 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of elements in the set $\{n\in\{1, 2, 3, ..., 100\} \mid (11)^n > (10)^n + (9)^n\}$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 89 Question Id : 86435117828 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Consider the following frequency distribution :

Class :	0 - 6	6 - 12	12 - 18	18 - 24	24 - 30
Frequency :	a	b	12	9	5

If $\text{mean} = \frac{309}{22}$ and $\text{median} = 14$, then the value $(a-b)^2$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 90 Question Id : 86435117829 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $y=y(x)$ be the solution of the differential equation

$$\left((x+2)\,e^{\left(\frac{y+1}{x+2}\right)}+(y+1)\right)dx=(x+2)\,dy,\ \ y(1)=1\,.$$ If the domain of $y=y(x)$ is an open interval (α, β), then $|\alpha+\beta|$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1